RESEARCH

Cariboo Forest Region

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Improving Douglas-fir Survival and Growth by Planting under a Stand of Juvenile Lodgepole Pine

INTRODUCTION

Douglas-fir is the dominant climax species in the Interior Douglas-fir (IDF) subzone, and forests are highly-valued for a multiple of resource uses, such as timber, range, recreation, aesthetics and wildlife habitat. As a moderately shade tolerant species in the IDF subzones, Douglas-fir does not grow well in open conditions - clearcuts or old wildfires - where there is increased light, diurnal extremes in air temperature, and frequent summer drought. Summer frost is the major limiting factor to acceptable survival and growth of fir on these IDF sites. On moister sites in the ICH and SBS subzones, fir is a productive seral species with less need for shade.

OBJECTIVES

This experimental project had two main objectives:

- To determine if the survival and growth of Douglas-fir can be improved over a range of environmental conditions by planting under a canopy of juvenile lodgepole pine, and
- To determine environmental differences between a clearcut site and a nearby juvenile pine stand in the IDFdk3 and attempt to relate them to seedling performance.

SITES

SITE	SUBZONE	DISTRICT
Elbow	ICHmk3	Horsefly
Moffat	SBSdw1	Horsefly
Locker	IDFdk3	Williams Lake
Gaspard	IDFdk4	Williams Lake
Valentine	IDFdk3	100 Mile

RESULTS

On all sites except the ICHmk3, Douglas-fir survival was significantly higher under the pine canopy than in the open. Survival was highest under the pine on the three IDF sites and lowest on the Valentine and Gaspard clearcuts (3% and 0%,

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respectively). Growing season frosts caused considerable mortality (up to 75%) on these clearcuts. Cattle trampling caused 50% of the total mortality in the opening at Locker. Snowshoe hare browsing also caused high mortality under the pine at Gaspard and Elbow.

On the Locker, Moffat and Elbow sites, seedlings growing in the openings had significantly larger mean diameters and leaders than those growing under the pine. These differences in growth between the pine overstory and clearcuts were particularly large on the Elbow site (ICHmk3). The best seedling growth was reported on the Elbow clearcut, in spite of some frost damage.

Monitoring of seedling microclimate conditions in the IDFdk3 for three growing seasons showed that the frequency and severity of summer frosts were considerably lower under the pine canopy (see figures below). Frost did occur under the pine, but temperatures rarely dropped below -1°C. The accumulated growing degree days were reduced by only 10% under the pine canopy. Soil temperatures at 15 cm depth were comparable under the pine and in the opening.

CONCLUSIONS

On the ICHmk3 site, survival of Douglas-fir planted under the pine was comparable to that in the clearcut. However, seedling growth under the pine was poor. In the moister subzones of the Region, it appears that Douglas-fir does not require the shade or frost protection provided by the pine, and clearcut regeneration with Douglas-fir is a viable option if the frost hazard is low.

Planting under pine provides suitable conditions for Douglas-fir seedling survival in the dry subzones (IDFdk3, IDFdk4 and SBSdw1) by reducing the severity of summer frosts and providing shade. However, this option for regenerating Douglas-fir must be cautiously considered. The pine provides cover for snowshoe hares and other wildlife, which may have a negative impact on seedling survival and growth. As well, a stocked pine stand does not appear to provide suitable conditions for seedling growth. Wider-spaced pine overstories may be more suitable.

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